Integumentary* System

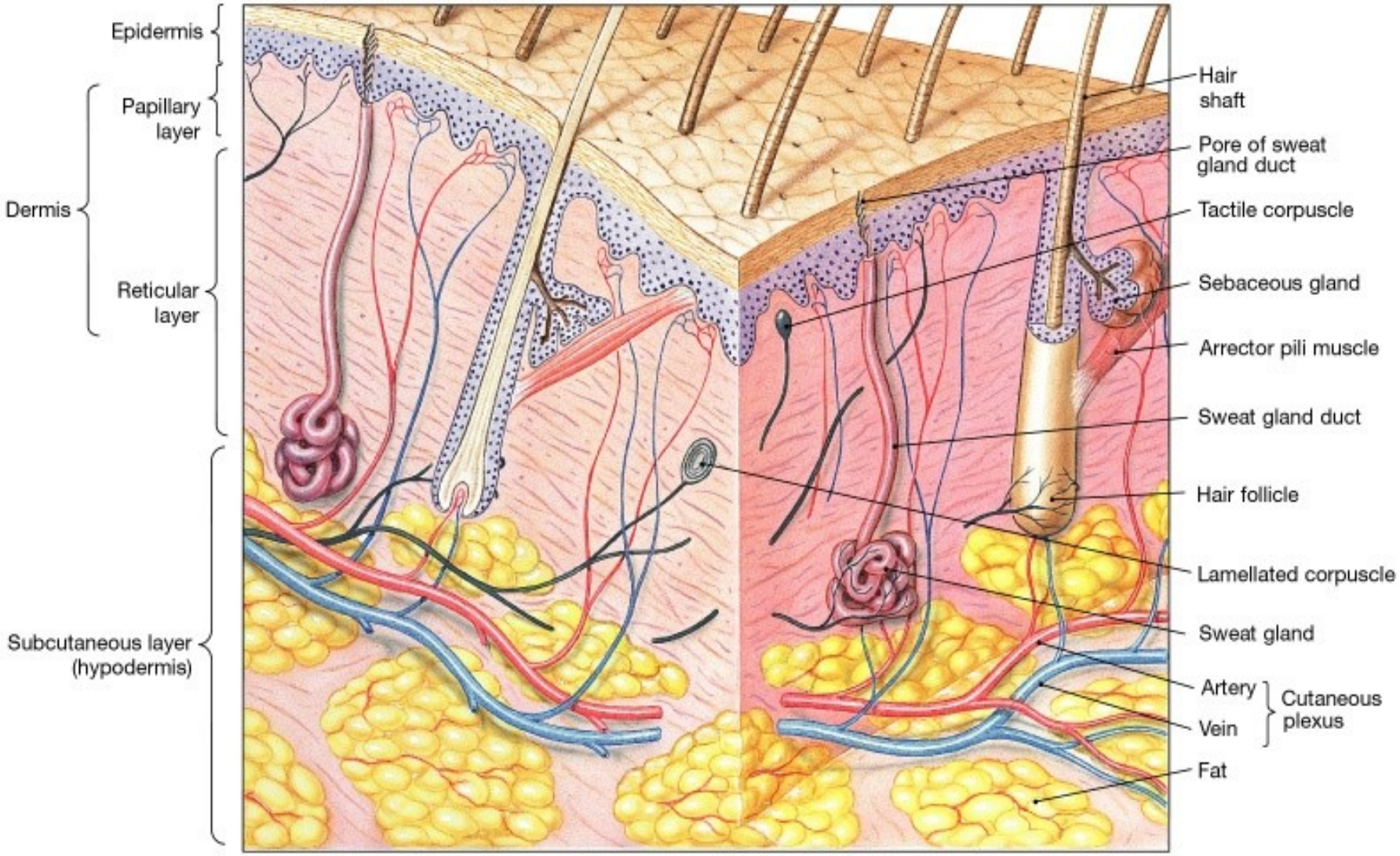
*From Latin integumentum "a covering," from integere "to cover over“.

Cutaneous Membrane (Skin)

- Superficial Epidermis (epithelial tissu
- Deeper Dermis (connective tissue)

- **Accessory Structures**
  - Hair and Hair Follicles
  - Exocrine Glands
  - Nails

The Integumentary System



nctions of the Integumentary Syste

1) Physical Barrier from Environment

2) Regulation of Body Temperature (T_b)

3) Secretions and Excretions

4) Vitamin D Synthesis

5) Sensations (receive sensory info)

6) Immunological Defense

Integument

Cutaneous Membrane + **Accessory Structures**

= 1. Epidermis
2. Dermis

1. Hair and Follicles

Stratified squamous

Protection

4 or 5 layers

2. Exocrine Glands

- Sebaceous
- Sweat (2 types)

Areolar and Dense Irreg

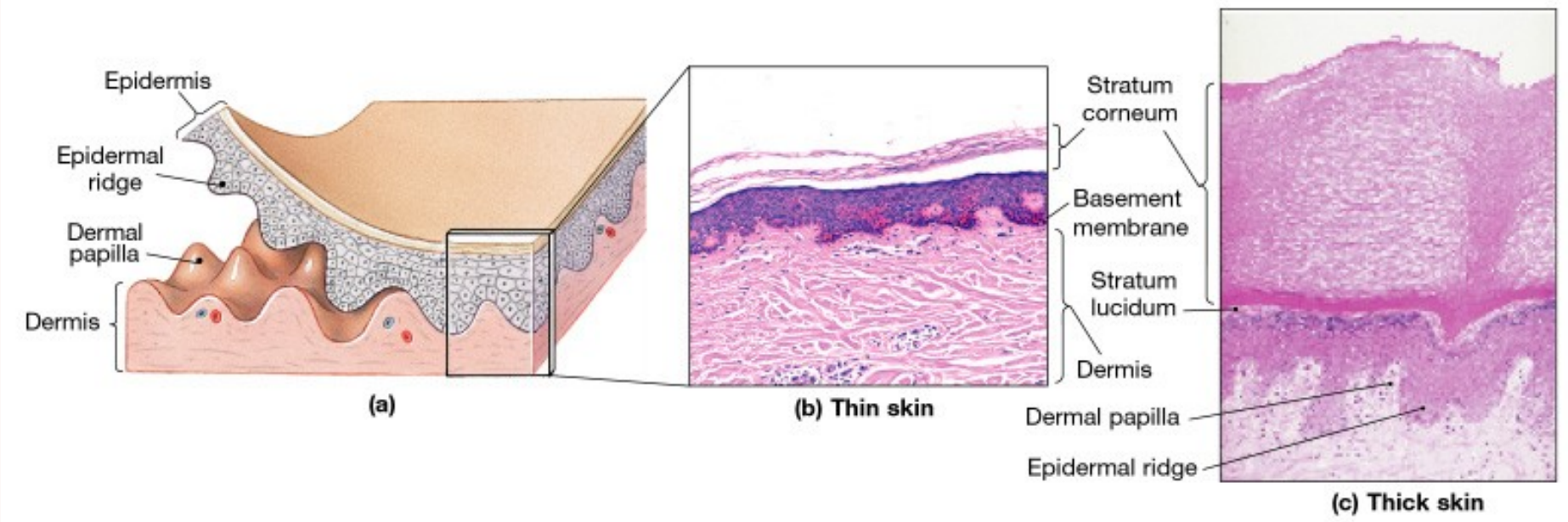
Papillary – superficial 1/5

Reticular – deep 4/5

3. Finger and Toe Nails

Epidermis = Stratified Squamous Epithelium.

The thickness of the epidermis varies.



Thin skin = ?

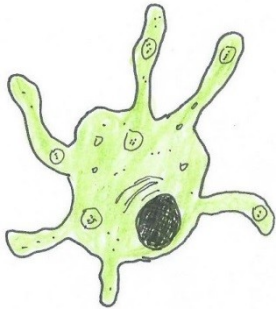
Thick skin = ?

Cells of the Epidermis

1. Keratinocytes

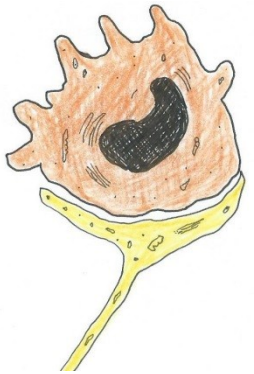
Most abundant cell (80-90 % of cells in epider
Produces *keratin*, a hydrophobic lipoprotein,
guards against water loss.

2. Melanocytes



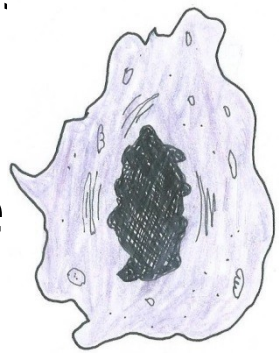
Produce the dark pigment ***melanin***
For protection against UVA rays
(10-20% of cells in epidermis).

3. Merkel cells



Cells for nervous sensation in the epidermis
Coupled with ‘nerve ending’ discs

4. Langerhans cells



Large **defense** cells in the epide
phagocytose substances.

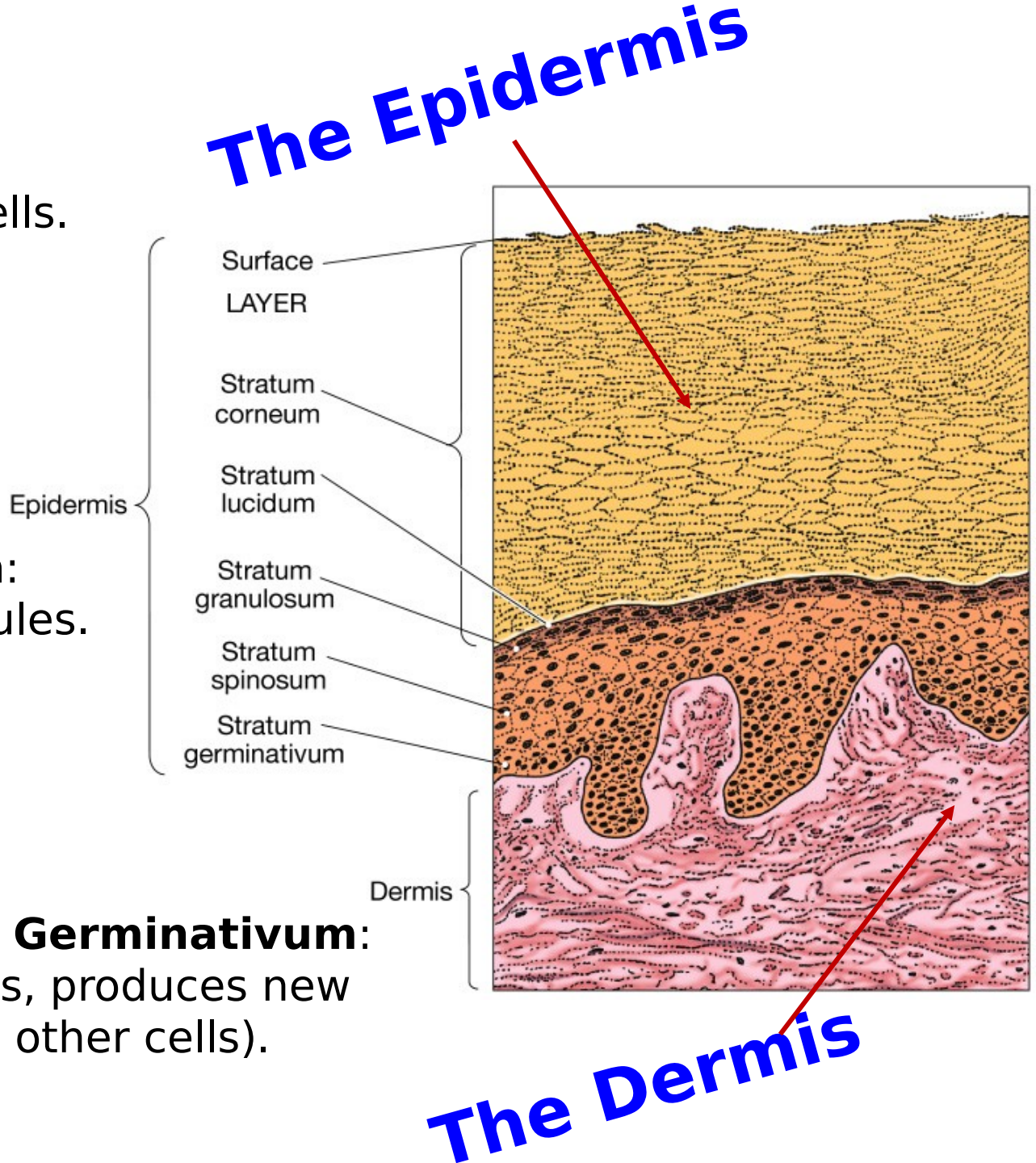
Stratum Corneum:
Most superficial layer,
many layers of dead cells.

Stratum Lucidum:
Translucent layer,
only in thick skin.

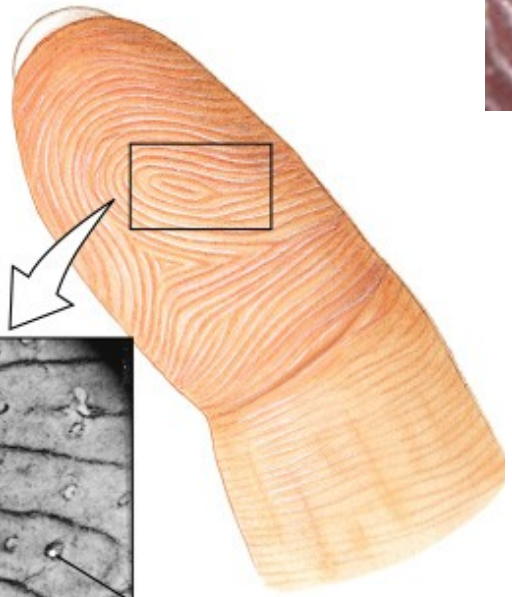
Stratum Granulosum:
Has dark staining granules.

Stratum Spinosum:
Can appear “spiny”.

Stratum Basale or Germinativum:
Division of basal cells, produces new keratinocytes (+ the other cells).



Role of Fingerprints?



The Dermis

Papillary Layer (areolar C.T.)
– nourishes and supports the epidermis.

Reticular Layer (Dense Irreg C.T.)
– attaches skin to deeper tissues.

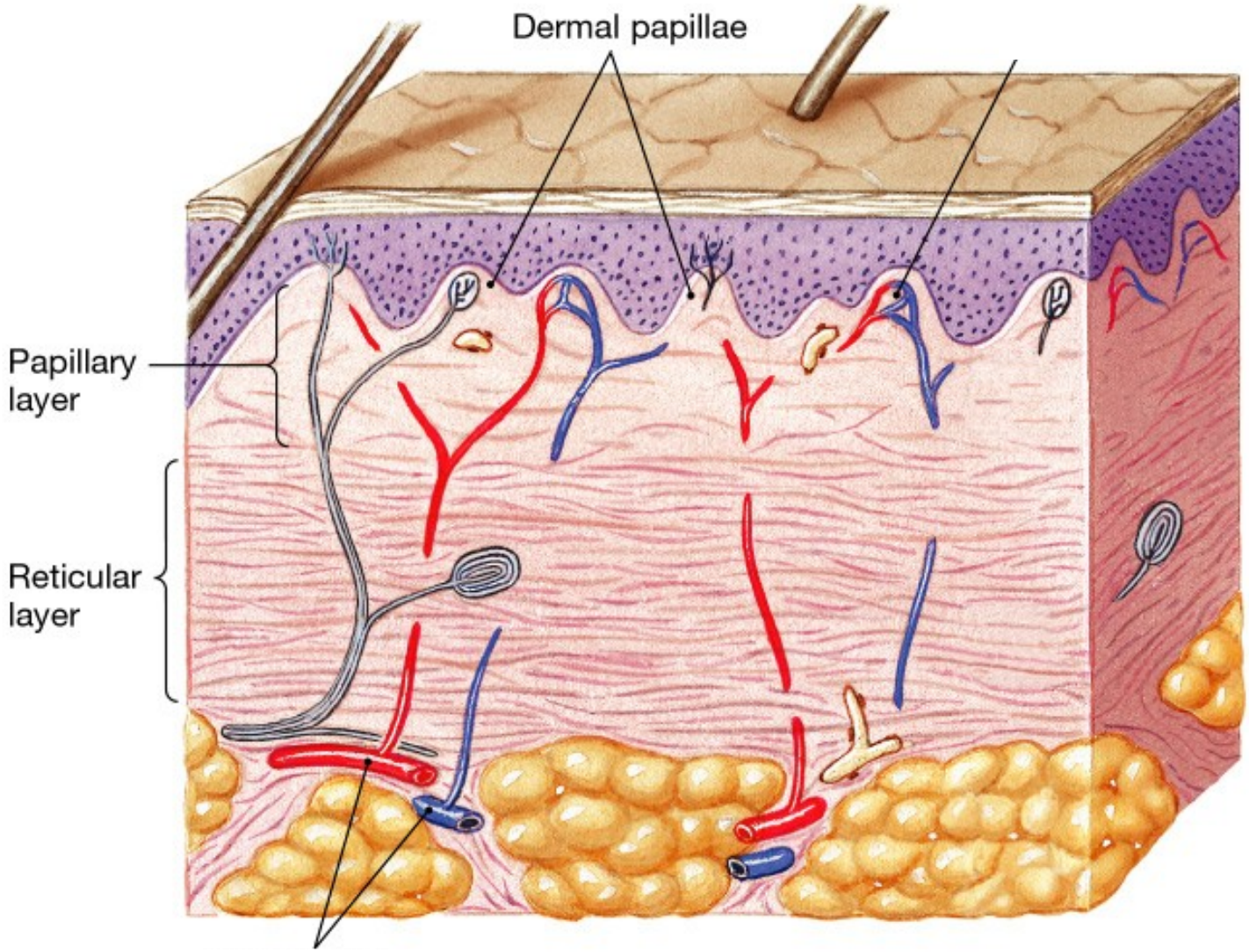
– restrict spread of pathogens (defense).

– sensory perception (touch, pressure, pain).

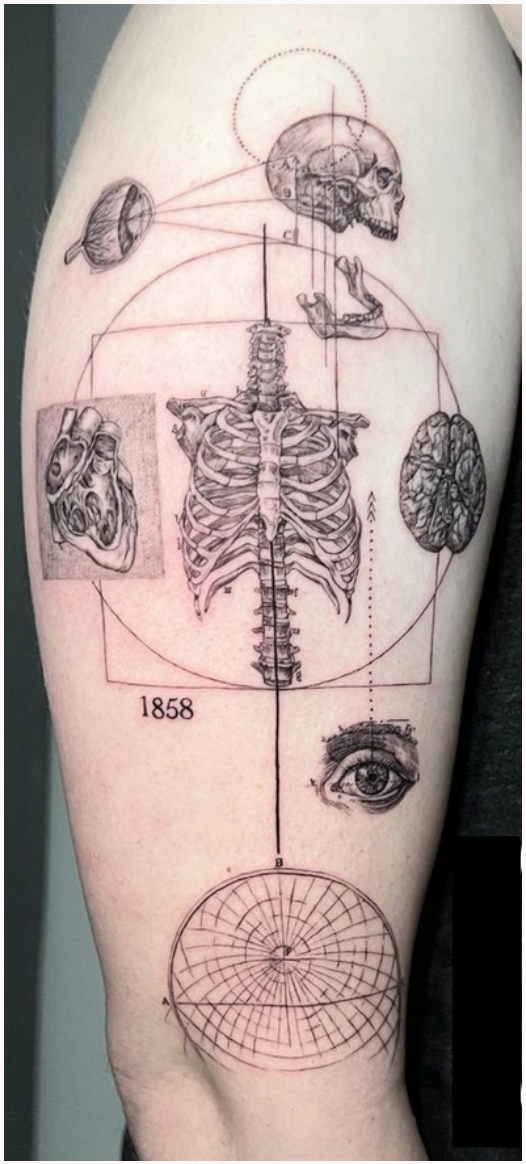
– thermoregulation via blood vessels.

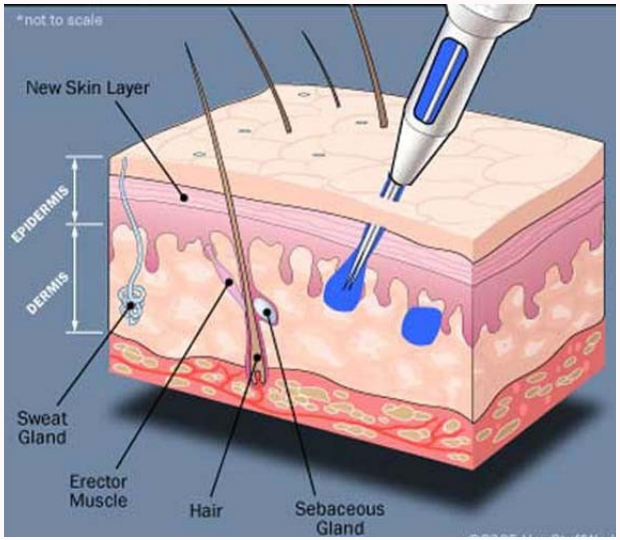
– many accessory structures located here.

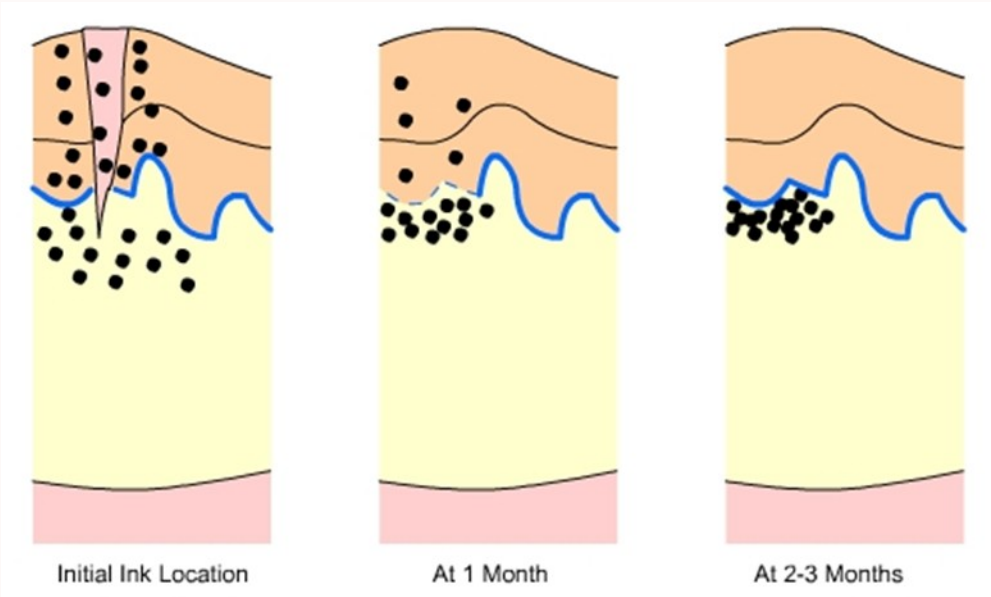
The Dermis

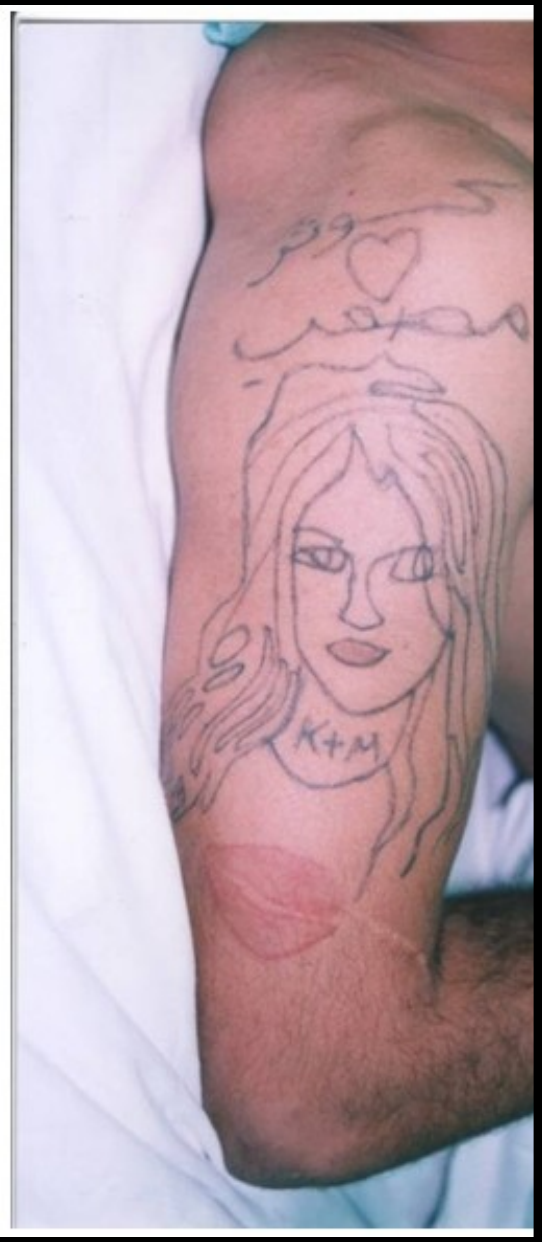


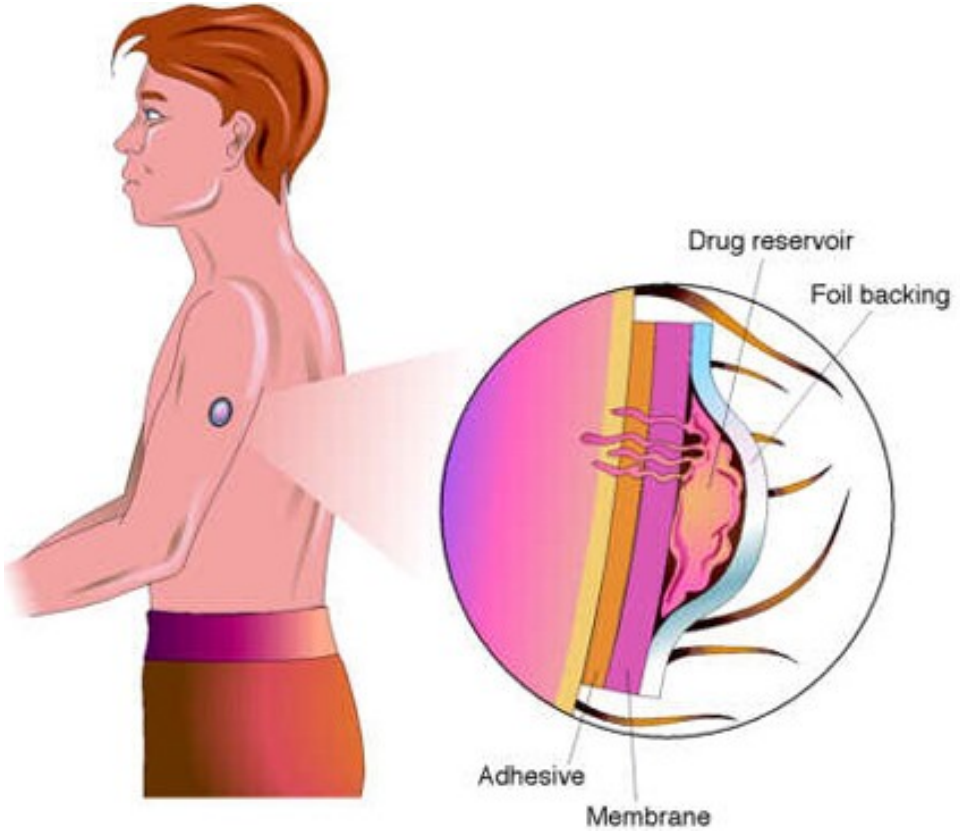
Anatomy of a Tattoo








K+M



Do substances get into your bloodstream from being in contact with your skin?

What factors would be important?

What are some examples?

The Subcutaneous Layer

Hypodermis Superficial Fascia

Roles

- Stabilizes skin’s position.

- Permits limited independent movement.

- Provides insulation and protection.

Skin Color

Depends on 3 Things:

1. Melanin: amount = darkness.
2. Carotene: from diet.
3. Hemoglobin (Hb) + amount of blood

HbO_2 = red Hb without O_2 = blue/purple

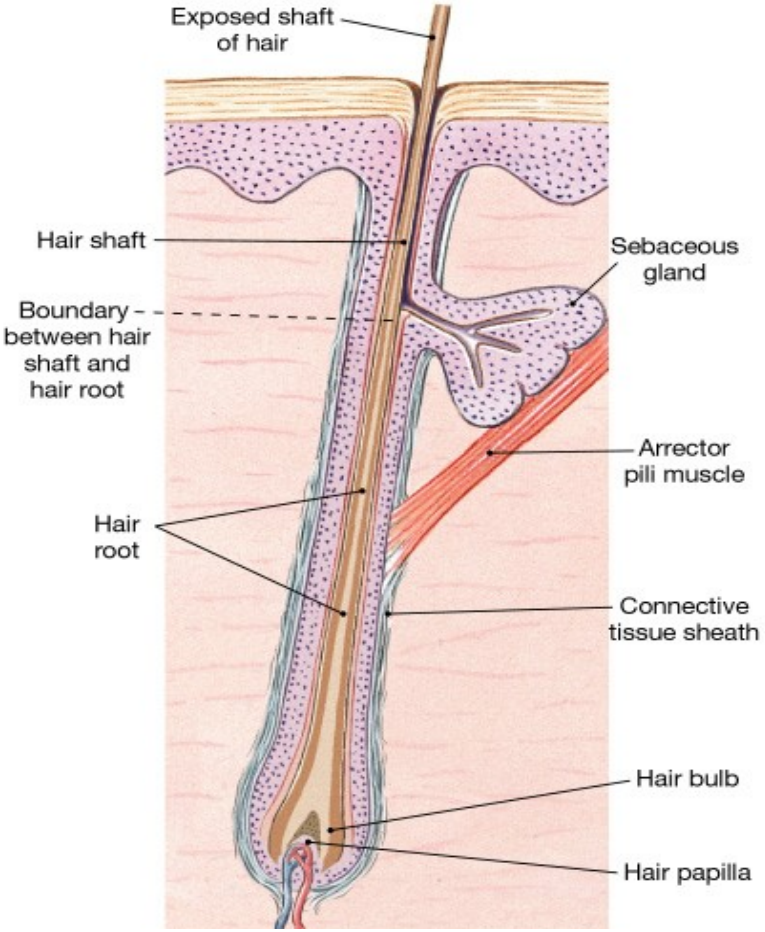
**If skin is thin, blood supply deep to it can be seen.*

undice, Pallor, Cyanosis, Albinism, Erythemia, Hematon

Accessory Structures of the Skin

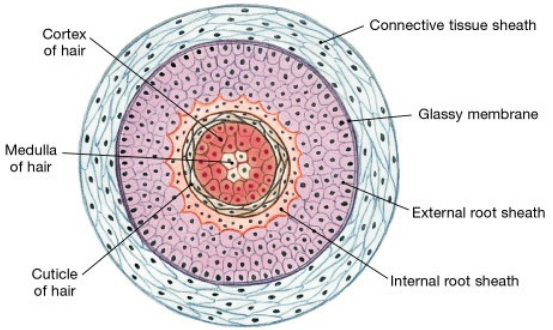
a) Hair
- Shaft
- Root
- Bulb

b) Hair Follicle
- medulla
- cortex



Hair shaft Longitudinal Section (l.s.)

Hair Root Cross Section (x.s.)



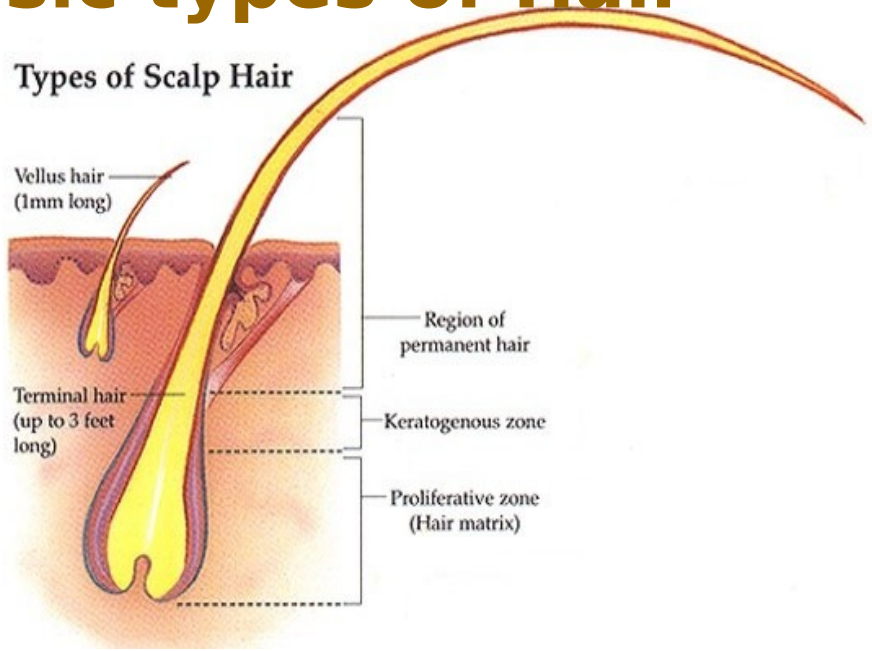
<u>Roles of Hair</u>:
- Protection
- Insulation
- Sensation?

Hair and the Hair Follicle

The **Hair shaft** has 3 layers:

- **Medulla** - innermost layer, has large cells.
- **Cortex** - layer between cuticle and medulla, contains keratin and pigment, the
- **Cuticle** - the outermost layer; transparent and protects the inner layers. A healthy cuticle can give hair a shiny appearance.

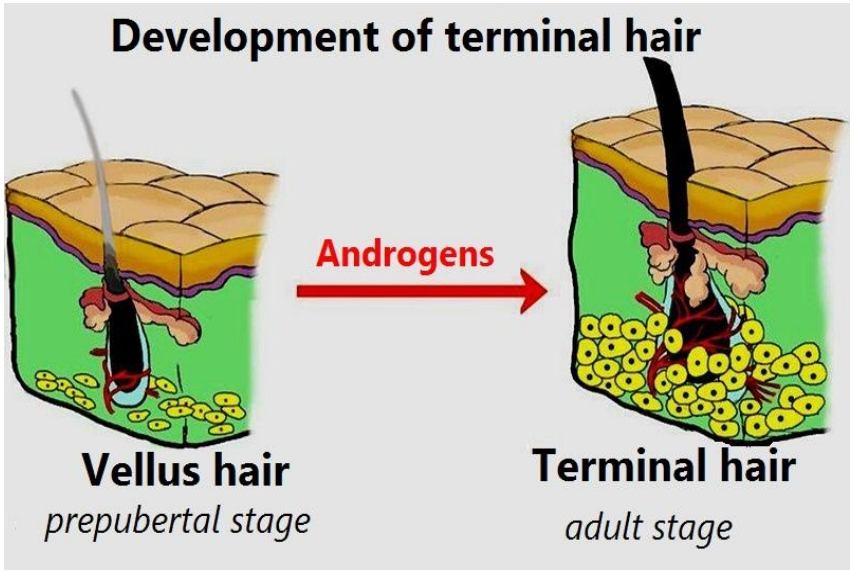
Basic types of Hair

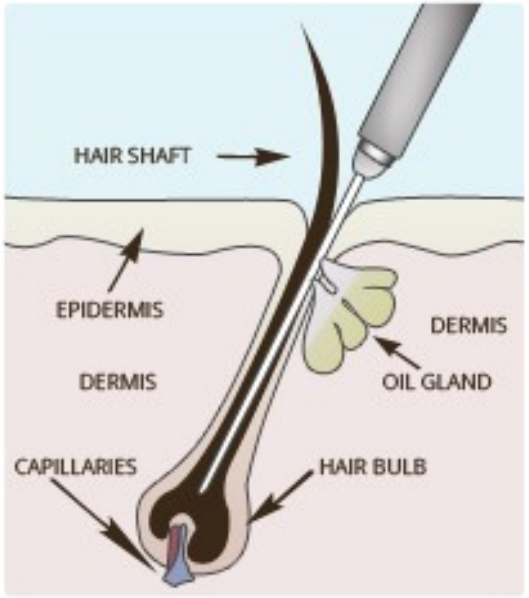


Vellus Hair - short, fine, lightly-colored hairs on a large % of body as a child. This hair helps regulate T_b. Only 0.5 cm long.

Terminal Hair - thick, long, darker hair, e.g. scalp hair. Can be many feet long.

Lanugo Hair – thin, soft, unpigmented baby hair covering unborn and newborn babies.





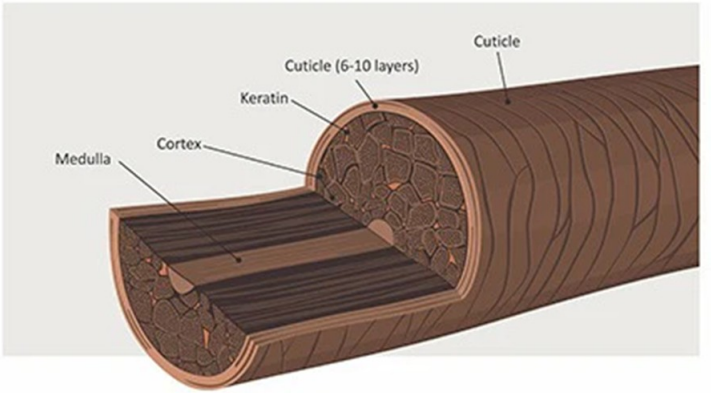
Hair Color and Texture

Hair Color:

Determined by the amount of **melanin** in hair bulb

More Melanin – Darker Hai

Less Melanin – Lighter Hair



Air Bubbles in Medulla – White Hair!

hair is Red, this is another iron (Fe) containing pigme
led trichosiderin.

Hair Color and Texture

Hair Texture:

Mostly determined by cross section of hair sh

Round – Straight Hair.

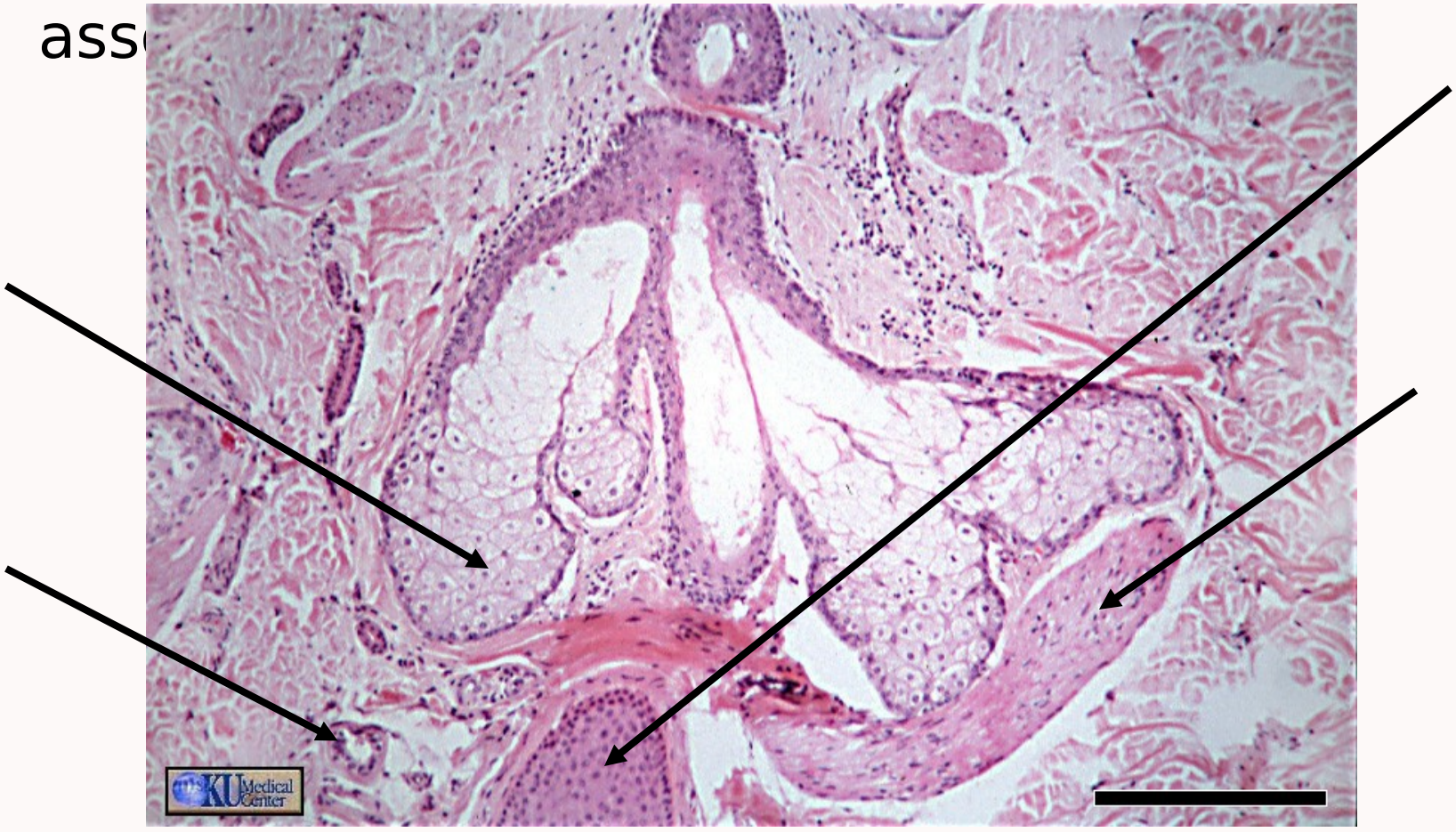
Oval – Curly Hair.

lat (Elliptical) – Kinky Hair.

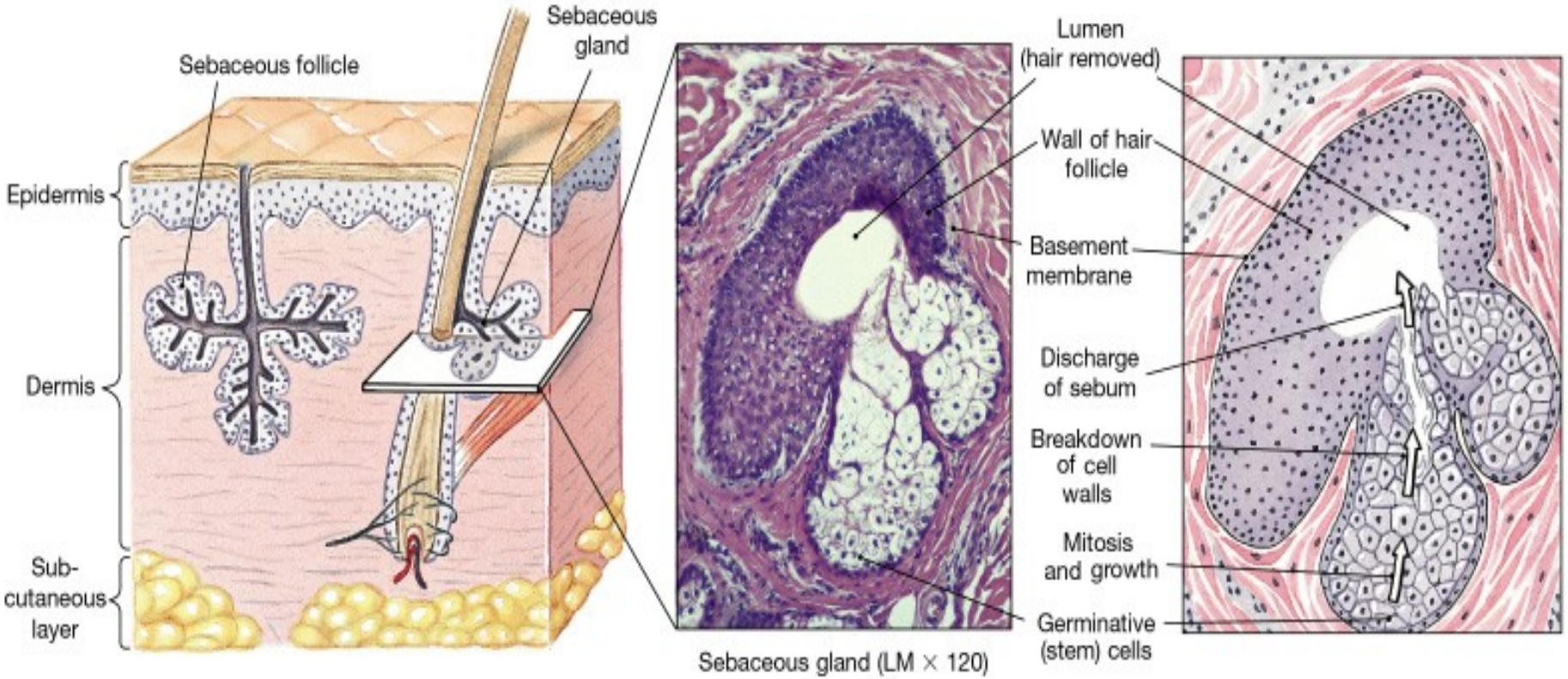
2. Exocrine Glands

Sebaceous (Oil) Glands

- Sebaceous ***Glands*** secret sebum onto hairs
- Sebaceous ***Follicles*** are large sebaceous glands not ass



Sebaceous Glands



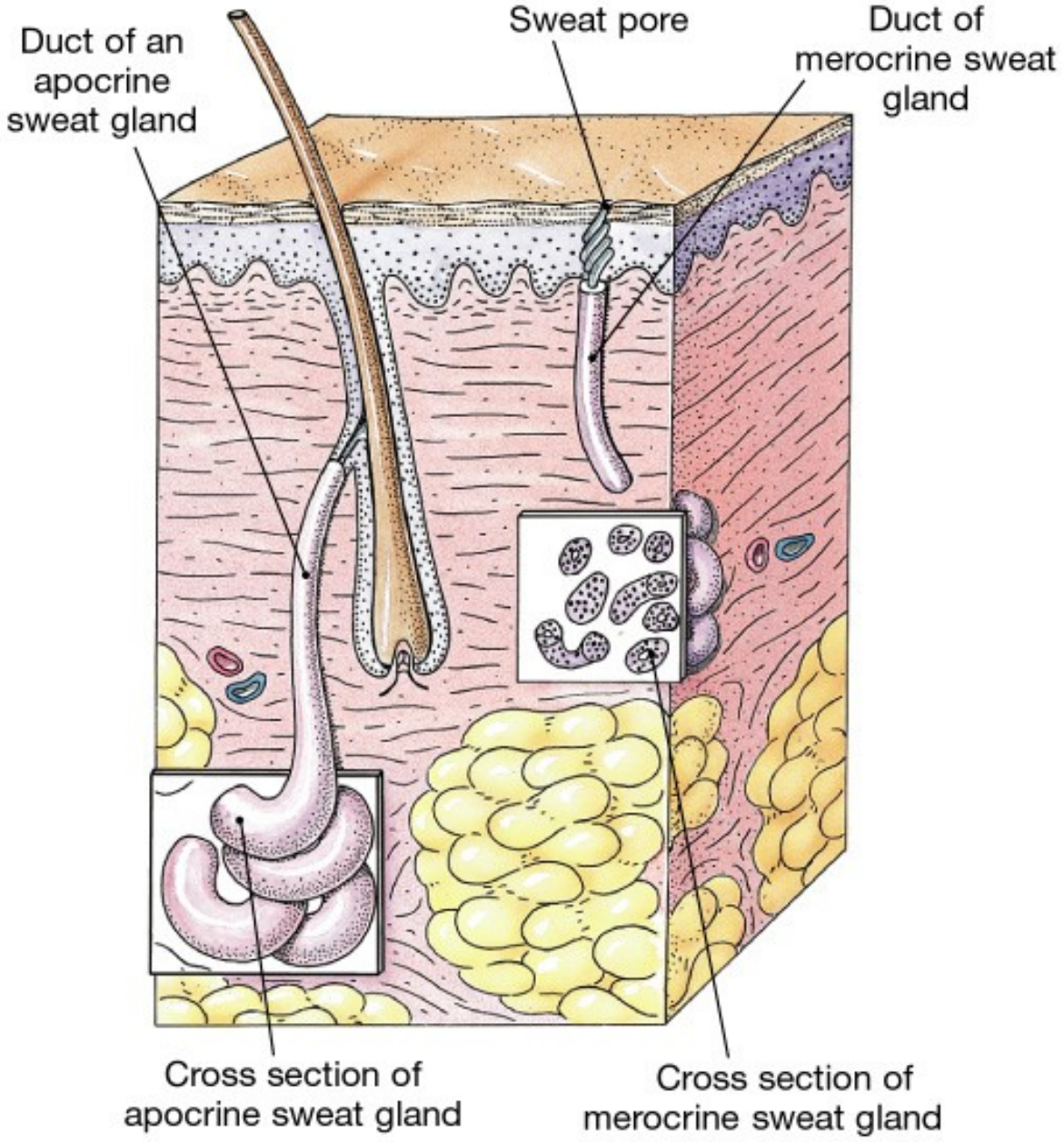
Sudoriferous (Sweat) Glands

1) **Merocrine Sweat Glands**
   Thin, watery, sensible perspiration, more numerous than apocrine, highest density on palms and soles.
2) **Apocrine Sweat Glands**
   Thicker, lipid rich secretion, only in specific regions of the body, e.g., axillary and inguinal regions.

Modified Apocrine Sweat Glands

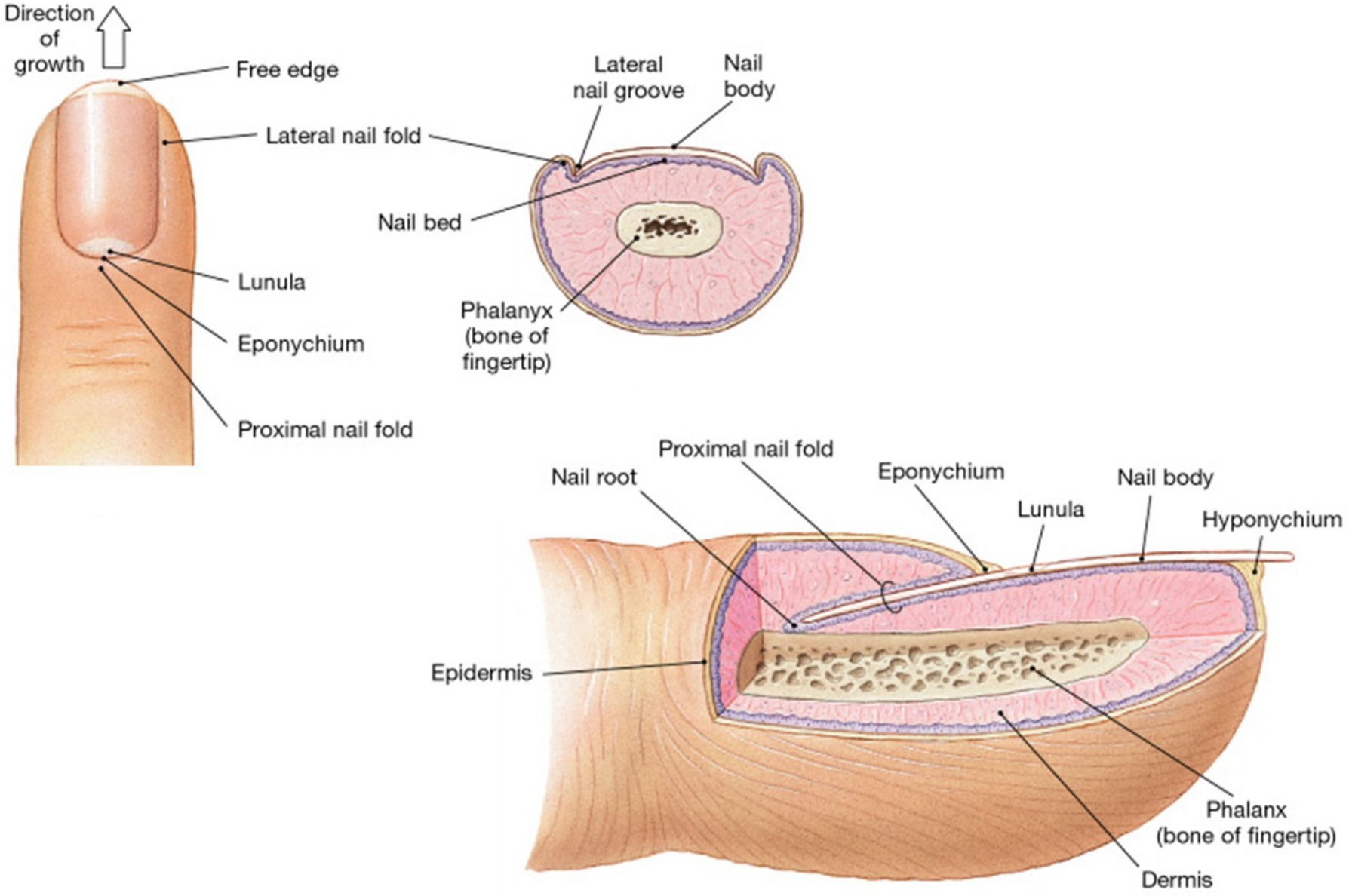
Mammary Glands
Large, complex apocrine sweat glands, produce milk as nourishment for babies.

Ceruminous Glands
Produces waxy cerumen (ear wax), found in ear canal to keep eardrum protection

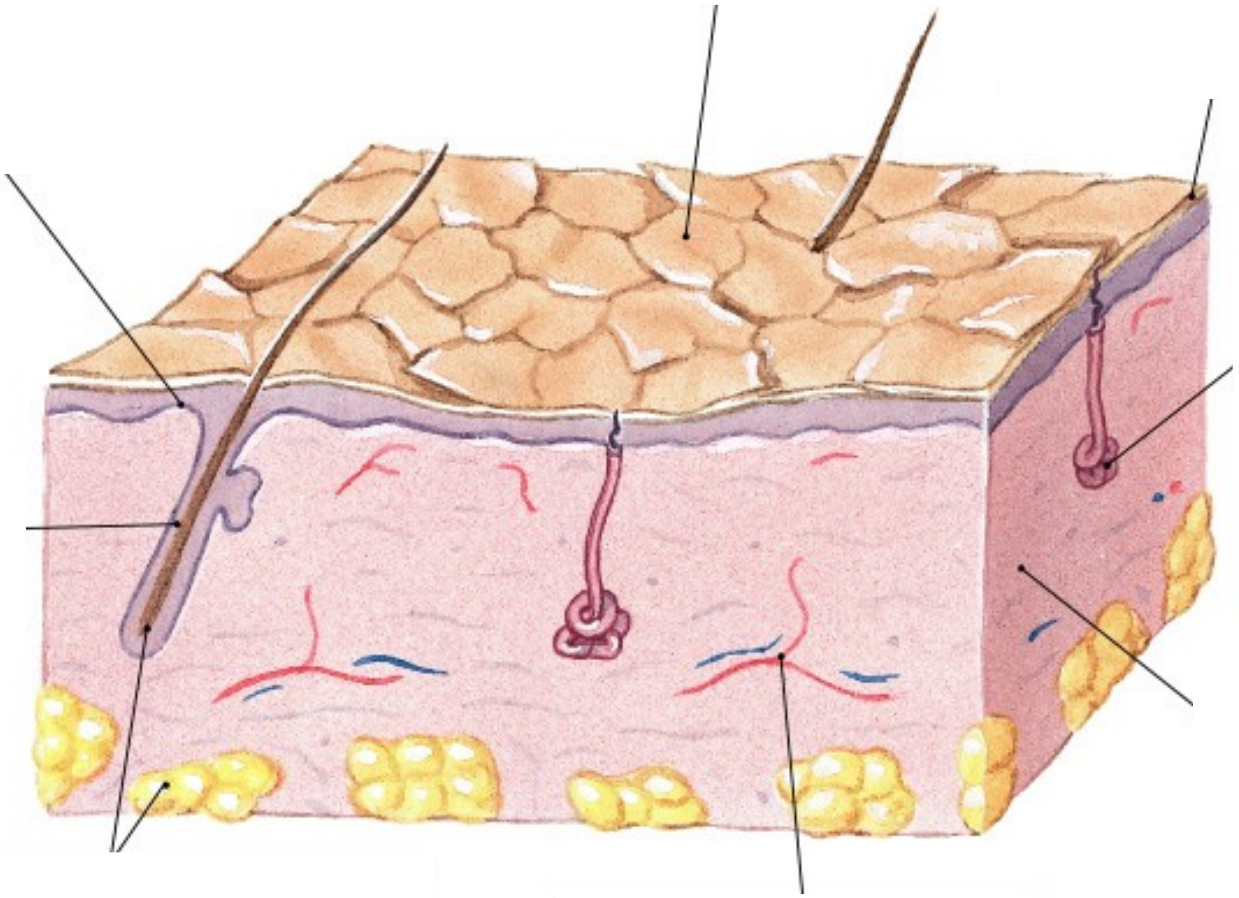

Duct of an apocrine sweat gland
Sweat pore
Duct of merocrine sweat gland
Cross section of apocrine sweat gland
Cross section of merocrine sweat gland

Sudoriferous (Sweat) Gland

3. Finger and Toe Nails



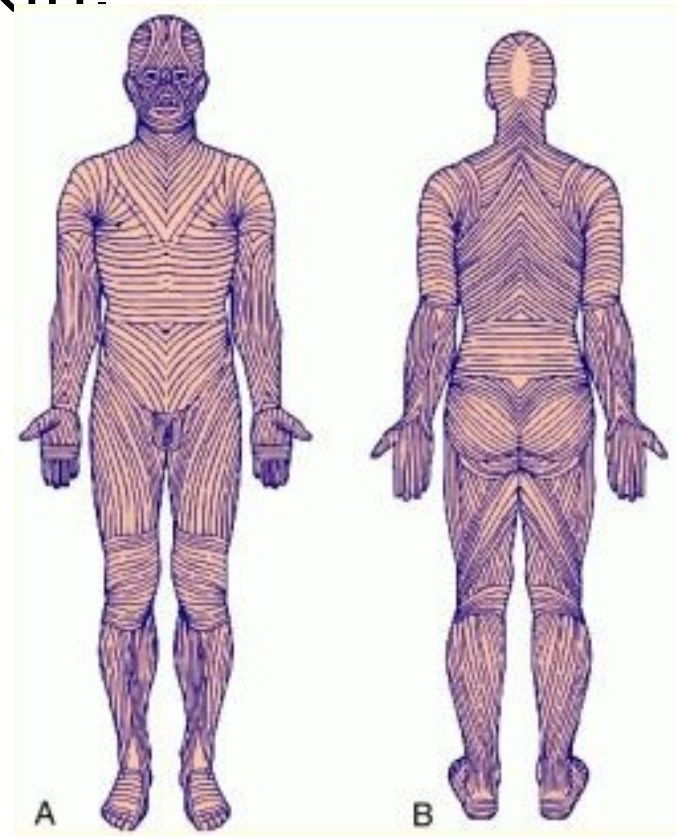
Aging of the Integumentary



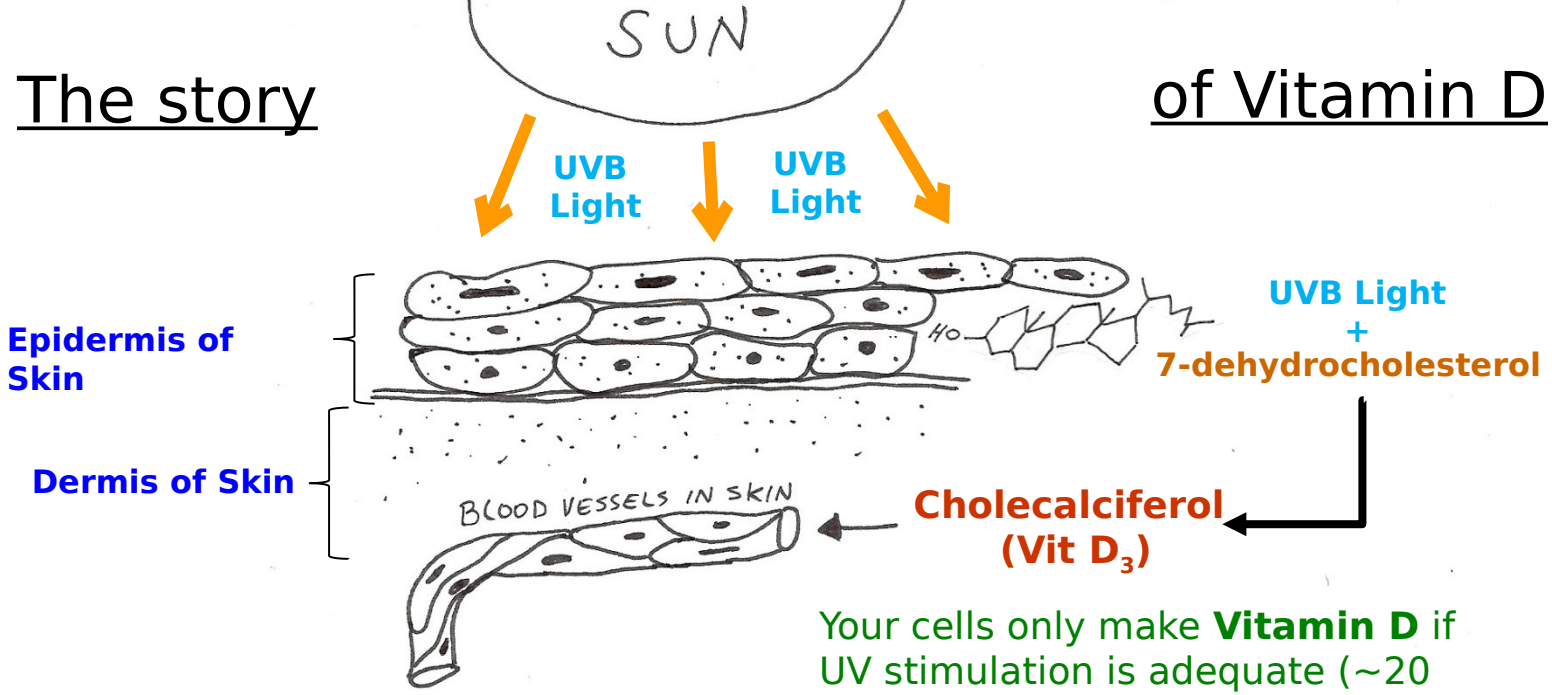
Burns and the Integument

	Tissue Damage	Tissue Appearance	Recovery and Risks
1st Degree	Epidermis is Damaged (or destroyed) Papillary of Dermis May be damaged	Red in color Painful (tender) Mild edema	2-3 days Skin cancer from Repeated burn
2nd Degree	Epidermis is Destroyed Dermis is Damaged + assoc. structures (=?)	Blister Painful Edema	1-2 weeks Typically don't pop blister (infection)
3rd Degree	Epi & Dermis are both Destroyed Deeper tissue Damage (e.g. ?)	Charred, black or white in color May not be painful	6 months - Infection - Dehydration

- Lines of cleavage follow lines of tension in the skin.
- Created by fiber patterns within the skin.



The story of Vitamin D



Your cells only make **Vitamin D** if UV stimulation is adequate (~20